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Appendix 12: Ornithology Apportioning Technical Note (Caledonia South)

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Acronyms and Abbreviations

BTO	British Trust for Ornithology
BDMPS	Biologically Defined Minimum Population Scales
HRA	Habitats Regulations Appraisal
JNCC	Joint Nature Conservation Committee
MD-LOT	Marine Directorate – Licensing Operations Team
MMFR	Mean Max Foraging Range
MS-LOT	Marine Scotland Licensing Operations Team
MSS	Marine Scotland Science
OWF	Offshore Wind Farm
RIAA	Report to Inform Appropriate Assessment
SD	Standard Deviation
SMP	Seabird Monitoring Programme
SPA	Special Protection Area

1 Introduction

1.1.1.1 This appendix provides the updated information on the seasonal apportioning of seabirds for the array area of Caledonia South, referred to as the Caledonia South Site, and forms part of the addendums submitted in response to the Marine Directorate – Licensing Operations Team request for Additional Information (dated 17 July 2025).

1.1.1.2 Background to the Proposed Development (Offshore) and the consent applications for Caledonia North and Caledonia South are presented within the original consent applications (Volume 1, Chapter 5: Proposed Development Phasing) and summarised within the covering addendum document (Volume 8: Caledonia Offshore Wind Farm EIAR and HRA Addendum).

1.1.1.3 This document has been prepared specifically to inform the consent application for Caledonia South and presents the apportioning of predicted impacts to designated breeding seabird colonies, specifically those associated with Special Protection Areas (SPAs) and Ramsar sites, as well as non-designated breeding colonies.

1.1.1.4 Apportioning is the process by which the predicted impacts of Caledonia South are allocated in a justifiable way to individual colonies.

2 Methods

2.1 Overview

2.1.1.1 The NatureScot Guidance Note 10 regarding apportioning impacts to breeding seabird colonies is not currently available as part of the NatureScot guidance to support offshore wind applications (NatureScot, 2023[1]). As such, the assessment presented within this Technical Note is primarily based on the NatureScot Interim Apportioning Guidance (NatureScot, 2018[2]) as advised by NatureScot within consultation workshops (07 March 2024 and 04 June 2025).

2.1.1.2 It is important to note that although the Proposed Development (Offshore) will be developed in two phases (Caledonia North and Caledonia South), the apportioning distances presented within this technical note are for Caledonia South Site (i.e., the array area of Caledonia South). Separate apportionment distances for Caledonia OWF and Caledonia South are presented in separate Technical Notes (Volume 8, Appendices 10 and 11).

2.2 Species and Relevant Colonies

2.2.1.1 Table 2-1 presents the seabird species for which apportioning was required based on the screening conclusions of Caledonia South, alongside the relevant impact pathway assessed for each species.

Table 2-1: Species and impacts for which apportioning was undertaken.

Species	Scientific Names	Nature of Impact
Kittiwake	*Rissa tridactyla*	Collision and distributional responses
Great black-backed gull	*Larus marinus*	Collision
Herring gull	*Larus argentatus*	Collision
Guillemot	*Uria aalge*	Distributional responses
Razorbill	*Alca torda*	Distributional responses
Puffin	*Fratercula arctica*	Distributional responses
Gannet	*Morus bassanus*	Collision and distributional responses

2.2.1.2 The species identified in Table 2-1 are protected as features of breeding designated colonies. It is noted that all designated sites screened in for assessment are SPAs, as such no Ramsar Sites are included within this appendix. Each bird has been apportioned to the designated sites within species-specific breeding season foraging ranges from the Caledonia South Site, defined as the mean max foraging range (MMFR) plus 1 standard deviation (SD) presented in Woodward *et al.* (2019[3]) (Table 2-2). It should be noted that the Interim Guidance from NatureScot (2018[2]) calls for the use of MMFR presented in Thaxter *et al.* (2012[4]); however, this has been superseded by Woodward *et al.* (2019[3]).

Table 2-2: Species specific foraging ranges as per Woodward *et al*. (2019[3]).

Species	Mean Max (km)	1 SD (km)	Total (km)
Kittiwake	156.1	144.5	300.6
Great black-backed gull	73.0	-	73.0
Herring gull	58.8	26.8	85.6
Guillemot	73.2 (55.5)*	80.5 (39.7)*	153.7 (95.2)*
Razorbill	88.7 (73.8)*	75.9 (48.4)*	164.6 (122.2)*
Puffin	137.1	128.3	265.4
Gannet**	315.2	194.2	509.4

* Distances in brackets exclude data from Fair Isle where foraging range may have been unusually high as a result of reduced prey availability during the study year (Woodward *et al.,* 2019[3]). These foraging ranges were used for sites south of the Pentland Firth for guillemot and razorbill as per the NatureScot Guidance Note 3 (NatureScot, 2023[1]).

** In line with NatureScot Guidance Note 3 (NatureScot, 2023[1]), site specific maximum foraging ranges were used to screen in connectivity to Forth Islands SPA, Grassholm SPA and St Kilda SPA. Forth Islands SPA and St Kilda SPA were within site specific maximum foraging ranges. As such Forth Islands has been assessed for gannet; however, St Kilda SPA was screened out due to the lack of expected connectivity when considering tracking data and literature evidence (as outlined within Application Document 13: Caledonia North Report to Inform Appropriate Assessment and Application Document 14: Caledonia South Report to Inform Appropriate Assessment).

2.2.1.3 A list of designated sites within MMFR + 1SD of the Proposed Development (Offshore) were identified within the HRA Screening Report (Volume 8, Appendix 9). This list was used to identify the sites considered in the apportioning assessment presented in this appendix. Table 2-3 provides the full list of designated sites and qualifying interests considered for apportioning.

2.2.1.4 The colony counts for the majority of designated and non-designated sites within foraging range (see Table 2-2) were derived from the British Trust for Ornithology (BTO) Seabird Monitoring Programme (SMP) database. Colony counts for East Caithness Cliffs SPA were derived from Burnell *et al*. (2023[5]) as requested by NatureScot within a consultation workshop regarding NatureScot representations following submission (04 June 2025). Colony counts are recorded as individuals, apparently occupied nests or apparently occupied sites; all counts recorded as apparently occupied nests or apparently occupied sites were treated as equivalent to pairs and were doubled to give the count as individuals. For guillemot and razorbill, a correction factor of x 1.34 was applied (Harris *et al*., 2015[6]) to SMP counts to give total adult breeding numbers. For puffin a correction factor of x 2.00 was applied to SMP counts (Hughes *et al.* 2019[7]; Mitchell *et al.* 2004[8]). Where sites are made up of multiple sub-sites, the most recent available counts were added together, in this case, a range of years is presented within Table 2-3 below.

Table 2-3: Designated colonies (feature or assemblage) identified for apportioning based on breeding season foraging range and/or connectivity during the non-breeding season, where the around coast distance to designated colonies has been measured from the centre of the Caledonia South Site to the centre of the designated colony.

Designated Site	Species	Foraging Range (km) (MMFR + 1SD)	Distance to Designated Site (km)	Count of Breeding Adults (individuals)	Year(s) of Count
East Caithness Cliffs SPA**	Kittiwake	300.6	59.6	48,958	2015 - 2021
	Great black-backed gull*	73.0	59.6	532	2015 - 2021
	Herring gull*	85.6	59.4	6,600	2015 - 2021
	Guillemot	95.2	59.5	199,966 (149,228)	2015 - 2021
	Razorbill	122.2	59.4	40,373 (30,129)	2015 - 2021
North Caithness Cliffs SPA	Kittiwake	300.6	64.6 – 121.6	18,608	2015 - 2024
	Guillemot	95.2	63.6 – 121.6	62,102 (46,345)	2015 - 2024
	Razorbill	122.2	63.6 – 121.6	12,329 (9,201)	2015 - 2024
	Puffin	265.4	64.6 – 123.3	6,766 (3,383)	2015 - 2024
Troup, Pennan and Lion's Heads SPA	Kittiwake	300.6	51.3 – 54.1	27,344	2017 - 2023
	Herring gull*	85.6	51.3 – 54.1	1,108	1995 - 2023
	Guillemot	95.2	51.3 – 53.7	47,719 (35,611)	2017 - 2023
	Razorbill	122.2	51.3 – 54.1	8,801 (6,568)	2017 - 2023

Designated Site	Species	Foraging Range (km) (MMFR + 1SD)	Distance to Designated Site (km)	Count of Breeding Adults (individuals)	Year(s) of Count
Copinsay SPA	Kittiwake	300.6	88.8	670	2023
	Guillemot	153.7	88.8 – 89.8	1,312 (979)	2015 - 2024
	Great black-backed gull*	73.0	88.8 – 89.8	97	2023 - 2024
Hoy SPA	Kittiwake	300.6	91.1 – 106.1	608	2016 – 2017
	Guillemot	153.7	91.1 – 109.0	16,345 (12,198)	2016 - 2017
	Puffin	265.4	91.1 – 109.0	722 (361)	2016 - 2017
Buchan Ness to Collieston Coast SPA	Kittiwake	300.6	95.4	27,094	2023
	Guillemot	95.2	95.4	40,763 (30,420)	2023
	Herring gull*	85.6	95.4	4,536	2023
Rousay SPA	Kittiwake	300.6	128.3 – 133.7	962	2016 - 2021
	Guillemot	153.7	128.3 – 134.5	7,921 (5,911)	2016 - 2018
Marwick Head SPA	Kittiwake	300.6	125.9	2,878	2023
	Guillemot	153.7	125.9	12,800 (9,552)	2023
Calf of Eday SPA	Kittiwake	300.6	125.9 – 129.2	324	2018 - 2024
	Guillemot	153.7	126.0 – 130.3	7,402 (5,524)	2018

Designated Site	Species	Foraging Range (km) (MMFR + 1SD)	Distance to Designated Site (km)	Count of Breeding Adults (individuals)	Year(s) of Count
West Westray SPA	Kittiwake	300.6	137.5 – 143.2	8,004	1999 - 2023
	Guillemot	153.7	137.5 – 145.5	43,035 (32,116)	2017 - 2023
	Razorbill	164.6	137.5 – 145.5	3,103 (2,316)	2017 - 2023
Fowlsheugh SPA	Kittiwake	300.6	151.0 – 154.8	40,156	2018 - 2023
Cape Wrath SPA	Kittiwake	300.6	177.5 – 193.0	6,656	2000 - 2023
	Puffin	265.4	175.9 – 190.5	428 (214)	2017 - 2023
Sule Skerry and Sule Stack SPA	Puffin	265.4	162.7	95,484 (47,742)	2018
	Gannet	509.4	162.7 – 163.8	15,648	2013 - 2024
	Guillemot	95.2	161.9 - 164.6	14,284 (10,660)	1998 - 2024
Fair Isle SPA	Kittiwake	300.6	167.1	896	2021
	Razorbill	164.6	167.1	2,580 (1,925)	2021
	Puffin	265.4	167.1	13,332 (6,666)	2015
	Gannet	509.4	167.1	11,184	2024
	Guillemot	153.7	167.1	24,515 (18,295)	2021
Sumburgh Head SPA	Kittiwake	300.6	208.1 – 211.8	691	2018 – 2023

Designated Site	Species	Foraging Range (km) (MMFR + 1SD)	Distance to Designated Site (km)	Count of Breeding Adults (individuals)	Year(s) of Count
Foula SPA	Kittiwake	300.6	228.6	1,193	2021
	Puffin	265.4	228.6	12,702 (6,351)	2016
North Rona and Sula Sgeir SPA	Kittiwake	300.6	242.8 – 261.0	1,424	2021
	Puffin	265.4	242.8 – 261.0	5,668 (2,834)	2021
	Gannet	509.4	261.0	18,990	2023
Forth Islands SPA***	Kittiwake	300.6	240.1 – 256.2	14,216	2019 - 2024
	Gannet	509.4	253.3	162,000	2021
	Puffin	265.4	240.1 – 283.1	117,960 (58,980)	2024
Noss SPA	Kittiwake	300.6	245.7	154	2024
	Puffin	265.4	240.8 – 245.7	1,194 (597)	2000 - 2023
	Gannet	509.4	245.7	24,670	2023
St Abb's Head to Fast Castle SPA	Kittiwake	300.6	263.4 – 265.0	11,992	2024
Hermaness, Saxa Vord and Valla Field SPA	Kittiwake	300.6	324.4 – 327.1	378	1999 - 2023
	Gannet	509.4	325.6	39,606	2024
Handa SPA	Kittiwake	300.6	217.8	9,178	2023
Shiant Isles SPA	Kittiwake	300.6	297.7 – 301.3	2,318	2015 - 2023

Designated Site	Species	Foraging Range (km) (MMFR + 1SD)	Distance to Designated Site (km)	Count of Breeding Adults (individuals)	Year(s) of Count
Farne Islands SPA	Kittiwake*	300.6	292.6	5,790	2024
Flamborough and Filey Coast SPA	Gannet*	509.4	481.0	31,588	2024

* Species assessed for the non-breeding season only, approach agreed with NatureScot via email on 07 August 2025.

** Colony counts taken from Burnell *et al*., 2023[5], approach agreed with NatureScot within a consultation meeting on 07 August 2025.

*** The Forth Islands SPA colony count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al*., 2023[9]; Wanless *et al*., 2023[10]) approach agreed with NatureScot within a consultation meeting on 07 August 2025.

Note, foraging ranges presented in "()" exclude data from Fair Isle where foraging range may have been unusually high (Woodward *et al*., 2019[3]). These foraging ranges were used for sites south of the Pentland Firth for guillemot and razorbill. Counts for guillemot and razorbill apply Harris *et al*. (2015[6]) correction factor x 1.34 for conversion to total adult breeding numbers. Counts for puffin apply a correction factor x 2.00 for conversion to total adult breeding numbers (Hughes *et al*. 2019[7]; Mitchell *et al*. 2004[8]). SMP counts are shown in "()". The distance of each colony was measured as the around land distance from the geometric centre of the Caledonia South Site to the geometric centre of the colony. When undertaking apportioning, colonies with multiple sites were treated separately and the geometric centre of each site within the colony was used (as such, distances presented differ between species depending on which sites had associated colony counts).

2.3 Definitions of Seasons

2.3.1.1 The defined breeding seasons for all species were derived from the NatureScot (2020[11]) guidance (see Table 2-4).

2.3.1.2 Apportioning outside the breeding season relies on information from Biologically Defined Minimum Population Scales (BDMPS) (Furness, 2015[12]). Furness (2015[12]) identifies autumn passage, spring passage and winter periods within the non-breeding season for kittiwake, gannet, and razorbill, as such apportioning weightings were derived for these periods using the period within which the mean peak was recorded for each species. The non-breeding defined seasons used within apportioning for kittiwake, razorbill, and gannet are presented in Table 2-4. The Furness (2015[12]) seasons were foreshortened to reduce overlap with the NatureScot breeding season definitions to avoid overestimating seasonal mortality estimates.

Table 2-4: Defined seasons in the Scottish Marine Environment used in the assessment for key species (NatureScot, 2020[11]).

Species	Breeding Season	Non-breeding Season
Kittiwake	Mid-April to August	September to Early April
Great black-backed gull	April to August	September to March
Herring gull	April to August	September to March
Common guillemot	April to mid-August	Late August to March
Razorbill	April to mid-August	Late August to March
Puffin	April to Mid- August	Late August to March
Gannet	Mid-March to September	October to Early-March

2.4 Apportioning Methods

2.4.1 Overview

2.4.1.1 The weightings obtained from the apportioning were used to allocate seasonal mortality estimates for each species by age class to seabird colonies.

2.4.2 Breeding Season

2.4.2.1 The assessment presented within this Technical Note is primarily based on the NatureScot Interim Guidance (NatureScot, 2018[2]) regarding apportioning impacts to breeding seabird colonies.

2.4.2.2 During the breeding season there is potential not only for breeding adult birds within foraging range of the project to have connectivity but also juvenile, immature and sabbatical birds which are not associated with any given colony. The first step in the apportionment process is therefore to calculate the proportion of breeding adult birds for which the project may impact.

2.4.2.3 The proportion of juvenile and immature birds comparatively to the number of breeding adults which may be connected to the project can typically be calculated using the age ratios from the digital aerial surveys or from using generalised stable age structure data. In relation to the use of age ratios from the digital aerial survey data, there are a number of key issues with accurately identifying age of key seabirds as detailed below.

2.4.2.4 For kittiwakes only first winter juvenile birds are readily distinguishable from other age categories, due to the distinct 'W pattern' across the wings and black tail-band (Svensson *et al*., 2009[13]). This pattern, however, is lost by the time a kittiwake reaches its second winter moult, whereby the bird is indistinguishable from an adult bird. As presented in Coulson (2011[14]), the modal age of kittiwakes first breeding is four years old, although the age of first breeding has been documented as late as 10 years old. This clearly shows that by simply applying the assumption that all adult plumage birds are breeding adults, as would be the case when using site-specific survey data, it is highly likely to overestimate the proportion of breeding adult birds within the Caledonia South Site.

2.4.2.5 For guillemot, razorbill and puffin only first winter juvenile birds are readily distinguishable from other age categories, with the distinguishing feature of juveniles being their size in comparison to the adult males in attendance of the chicks. After their first winter immature auks are indistinguishable from breeding adult birds. The average breeding age for guillemot, razorbill and puffin is six, five and five years old (Horswill and Robinson, 2015[15]) respectively. Therefore, the treatment that all 'adult type' appearance birds are breeding adults, as would be the case when using site-specific survey

data, it is highly likely to overestimate the proportion of breeding adult birds with the project area.

2.4.2.6 In relation to gannet, with juvenile (first calendar year birds) plumage being primarily grey/brown in colour with a lack of a distinct yellow head (Svensson *et al*., 2009[13]) this makes them distinctly different to adult birds. For second calendar year birds, the grey-brown plumage on the head, underparts, uppertail-coverts and usually some of the lesser wing uppertail-coverts becomes white (Svensson *et al*., 2009[13]), makes this age category readily distinguishable from adult birds. For third calendar year birds most tail-feathers and secondaries are usually black intermixed with white feathers, whilst the remaining body and head largely resemble the plumage of an adult bird, although these birds are still readily identifiable from adult birds, depending on the quality of the survey data and behaviour of the bird recorded (e.g., banking birds) might be difficult to observe and therefore this age category may be less regularly distinguished from adult birds. For fourth calendar year birds only the central tail-feathers and the odd scattered secondaries remain black, the rest of the bird's plumage resembles that of an adult bird, depending on the quality of the survey data and behaviour of the bird recorded (e.g., banking birds) might be difficult to observe and therefore this age category may be less regularly distinguished from adult birds. From fourth calendar year onwards the plumage of gannets remains indistinguishable, with the average age of first breeding at five years old. There is therefore potential to overestimate the proportion of breeding adult birds with the project area when using site-specific survey data.

2.4.2.7 Furthermore, not all adult birds within the Caledonia South Site can be classified as breeding birds. This is evidenced from adult sabbatical birds free roaming the North Sea whilst taking a break from breeding activities (Marine Scotland, 2017[16]). A sabbatical rate of 10% for gannet and kittiwake populations and 7% for auk species was advocated by Marine Scotland based on expert opinion for inclusion within other Scottish projects such as Moray West and other Forth and Tay projects and therefore has been applied to assessments for Caledonia South also. Sabbatical rates for great black-backed gull and herring gull were derived from Horswill and Robinson (2015[15]).

2.4.2.8 The data presented in Furness (2015[12]) are considered to provide a more accurate representation of population age structure than site-specific survey data for reasons set out above. Furthermore, Furness (2015[12]) draws upon a wide number of data sources gathered across multiple years to model population age structure, thus reducing the potential for any bias associated with the snapshot nature of site-based surveys. A summary of the adult/immature age ratio for key seabirds is provided in Table 2-5.

Table 2-5: Proportion of adult, immature and sabbatical birds included within the apportionment process.

Species	Adult/Immature Ratio	Sabbatical Rate	Total Breeding Adult Percentage
Kittiwake	53% / 47%	10%	47.70%
Guillemot	57% / 43%	7%	53.01%
Razorbill	57% / 43%	7%	53.01%
Puffin	55% / 45%	7%	51.15%
Gannet	55% / 45%	10%	49.50%

2.4.2.9 Once the number of breeding adults potentially impacted has been calculated, the next step is to apportion impacts from Caledonia South to each specific breeding colony with potential connectivity. This was undertaken following NatureScot's (2018[2]) interim guidance. The methodology calculates a proportional weighting for each colony based on the following three weighting factors:

- The population size of each colony (individuals);
- The distance from the center of the proposed array area to the center of the colony; and
- The available sea area within MMFR + 1SD of the colony, expressed as a proportion of total potential area.

2.4.2.10 These weighting factors are combined to form the following equation:

$$Weight = \left(\frac{Colony\ Population}{Sum\ of\ Populations}\right) \times \left(\frac{Sum\ of\ Distance^2}{Colony\ Distance^2}\right) \times \left(\frac{\frac{1}{Colony\ Sea\ Proportion}}{Sum\ of\ \frac{1}{Sea\ Proportions}}\right)$$

2.4.2.11 The population estimates at the relevant designated sites included in the calculation are detailed Table 2-3. Population estimates at additional colonies and non-designated sites are presented within Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South). These counts were obtained from the BTO SMP database, with the exception of counts made of East Caithness Cliffs SPA. For the East Caithness Cliffs SPA, counts from were derived from Burnell *et al*. (2023[5]) as requested by NatureScot within a consultation workshop regarding NatureScot representations following submission (04 June 2025).

2.4.2.12 Foraging ranges are based on at sea distances taking into account land barriers to movements for species which are known to avoid commuting over land.

2.4.2.13 Distances between colonies and the Caledonia South Site, and the percentage of area at sea for each colony, were calculated in QGIS. As per the NatureScot (2018[2]) Interim Guidance, the distance of the colony was measured as the around land distance from the geometric centre of the Caledonia South Site to the geometric centre of the colony, taking the shortest at sea distance route possible to identify colonies for inclusion within assessments. When undertaking apportioning, colonies with multiple sites were treated separately and the geometric centre of each site within the colony was used. Sea area was calculated by buffering the colony centroid by the seabirds MMFR + 1SD then removing all area over land and areas where seabirds are unlikely to forage such as estuaries.

2.4.3 Non-breeding Season

2.4.3.1 The BDMPS population estimates were used to apportion all birds present at the Caledonia South Site during the non-breeding season to breeding colony populations for all species, except for guillemot (Furness, 2015[12]). The BDMPS and associated abundance estimates presented in Furness (2015[12]) are based upon data on demography, migration and modelled population age structure from the UK and overseas. For most species, the relevant BDMPS region for Caledonia South is the UK North Sea and Channel waters, except for kittiwake and great black-backed gull for which the UK North Sea waters is the most relevant BDMPS region.

2.4.3.2 For guillemot, apportioning for the non-breeding season was based on the breeding population found within the MMFR + 1SD of the Caledonia South Site. This is in line with the approach outlined in the NatureScot Guidance Note 3 (NatureScot, 2023[1]), based on recent geolocator studies presented in Buckingham *et al.* (2022[17]).

3 Results

3.1 Breeding season

3.1.1 Overview

3.1.1.1 The apportioning weightings of predicted impacts from the Caledonia South Site for all designated site qualifying features screened in for assessment are provided within this section for the breeding season (Table 3-1 to Table 3-5). Full lists of colonies and apportioning weightings of predicted impacts for non-designated sites are provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South).

3.1.2 Kittiwake

3.1.2.1 The weightings for apportioning breeding season kittiwake to designated sites within MMFR+1SD of the Caledonia South Site are provided in Table 3-1. These weightings were used to apportion the potential number of kittiwake distributional response and collision mortalities during the breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

3.1.3 Guillemot

3.1.3.1 The weightings for apportioning breeding season guillemot to designated sites within MMFR+1SD of the Caledonia South Site are provided in Table 3-2. These weightings were used to apportion the potential number of guillemot distributional response mortalities during the breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

3.1.4 Razorbill

3.1.4.1 The weightings for apportioning breeding season razorbill to designated sites within MMFR+1SD of the Caledonia South Site are provided in Table 3-3. These weightings were used to apportion the potential number of razorbill distributional response mortalities during the breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-1: Kittiwake breeding season (Mid-April to August) apportioning weightings to designated sites.

Site Name	SMP Database Counts (Individuals)	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
East Caithness Cliffs SPA*	48,958	59.6	0.02	2.57	0.397
North Caithness Cliffs SPA	18,608	64.6 – 121.6	0.20	0.333	0.051
Troup, Pennan and Lion's Heads SPA	27,344	51.3 – 54.1	0.09	1.856	0.287
Copinsay SPA	670	88.8	0.05	0.012	0.002
Hoy SPA	608	91.1 – 106.1	0.09	0.010	0.002
Buchan Ness to Collieston Coast SPA	27,094	95.5	0.02	0.545	0.084
Rousay SPA	962	128.3 – 133.7	0.11	0.008	0.001
Marwick Head SPA	2,878	125.9	0.01	0.026	0.004
Calf of Eday SPA	324	125.9 – 129.2	0.05	0.003	<0.001
West Westray SPA	8,004	137.5 – 143.2	0.06	0.056	0.009
Fowlsheugh SPA	40,156	151.0 – 154.8	0.07	0.377	0.058
Cape Wrath SPA	6,656	177.5 – 193.0	0.35	0.032	0.005
Fair Isle SPA	896	167.1	0.01	0.004	0.001
Sumburgh Head SPA	691	208.1 – 211.8	0.04	0.002	<0.001
Foula SPA	1,193	228.6	0.01	0.003	<0.001

Site Name	SMP Database Counts (Individuals)	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
North Rona and Sula Sgeir SPA	1,424	242.8 – 261.0	0.02	0.003	<0.001
Forth Islands SPA	14,216	240.1 – 256.2	0.15	0.068	0.011
Noss SPA	154	245.7	0.01	<0.001	<0.001
St Abb's Head to Fast Castle SPA	11,992	263.4 – 265.0	0.09	0.045	0.007
Handa SPA	9,178	217.8	0.01	0.032	0.005
Shiant Isles SPA	2,318	297.7 – 301.3	0.07	0.004	0.001
Hermaness, Saxa Vord and Valla Field SPA	378	324.4 - 327.1	0.05	<0.001	<0.001
Additional colonies and non-designated sites	50,680	51.3 – 356.2	3.66	0.481	0.074

Note the residual weight assigned to non-SPA colonies are presented here as an overall total. Further breakdown of these sites is provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South).

* Colony counts taken from Burnell *et al*. (2023[5]).

Table 3-2: Guillemot breeding season (April to mid-August) apportioning weightings to designated sites.

Site Name	SMP Database Counts (Individuals)	Breeding Individuals*	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
East Caithness Cliffs SPA**	149,228	199,966	59.5	0.02	2.044	0.652
North Caithness Cliffs SPA	46,345	62,102	63.6 – 121.6	0.27	0.258	0.082
Troup, Pennan and Lion's Heads SPA	35,611	47,719	51.3 – 53.7	0.08	0.503	0.161
Copinsay SPA	979	1,312	88.8 – 89.8	0.03	0.003	0.001
Hoy SPA	12,198	16,345	91.1 – 109.0	0.14	0.039	0.012
Buchan Ness to Collieston Coast SPA	30,420	40,763	95.4	0.01	0.121	0.039
Rousay SPA	5,911	7,921	128.3 – 134.5	0.11	0.009	0.003
Marwick Head SPA	9,552	12,800	125.9	0.01	0.017	0.005
Calf of Eday SPA	5,524	7,402	126.0 – 130.3	0.08	0.009	0.003
West Westray SPA	32,116	43,035	137.5 - 145.5	0.07	0.044	0.014
Sule Skerry and Sule Stack SPA	10,660	14,284	161.9 - 164.6	0.02	0.012	0.004
Fair isle SPA	18,295	24,515	167.1	0.01	0.017	0.005
Additional colonies and non-designated sites	19,965	26,753	54.9 – 146.2	0.60	0.059	0.019

Site Name	SMP Database Counts (Individuals)	Breeding Individuals*	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
Note, the residual weight assigned to non-SPA colonies are presented here as an overall total. Further breakdown of these sites is provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South). * Applying Harris *et al*. (2015[6]) correction factor x 1.34 for total adult breeding numbers. ** Colony counts taken from Burnell *et al*. (2023[5]).						

Table 3-3: Razorbill breeding season (April to mid-August) apportioning weightings to designated sites.

Site Name	SMP Database Counts (Individuals)	Breeding Individuals*	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
East Caithness Cliffs SPA**	30,129	40,373	59.4	0.02	2.184	0.672
North Caithness Cliffs SPA	9,201	12,329	63.6 – 121.6	0.28	0.237	0.073
Troup, Pennan and Lion's Heads SPA	6,568	8,801	51.3 - 54.1	0.10	0.492	0.151
West Westray SPA	2,316	3,103	137.5 – 145.5	0.08	0.016	0.005
Fair Isle SPA	1,925	2,580	167.1	0.01	0.009	0.003
Additional colonies and non-designated sites	16,835	22,559	51.3 – 164.6	1.85	0.311	0.096
Note the residual weight assigned to non-SPA colonies are presented here as an overall total. Further breakdown of these sites is provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South). * Applying Harris *et al*. (2015[6]) correction factor x 1.34 for total adult breeding numbers. ** Colony counts taken from Burnell *et al*. (2023[5]).						

3.1.5 Puffin

3.1.5.1 The weightings for apportioning breeding season puffin to designated sites within MMFR+1SD of the Caledonia South Site are provided in Table 3-4. These weightings were used to apportion the potential number of puffin distributional response mortalities during the breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-4: Puffin breeding season (April to Mid- August) apportioning weightings to designated sites.

Site Name	SMP Database Counts (Individuals)	Breeding Individuals*	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
North Caithness Cliffs SPA	3,383	6,766	64.6 – 123.3	0.27	0.067	0.039
Hoy SPA	361	722	91.1 – 109.0	0.10	0.013	0.007
Cape Wrath SPA	214	428	175.9 – 190.5	0.35	0.003	0.002
Sule Skerry and Sule Stack SPA	47,742	95,484	162.7	0.01	0.340	0.200
Fair Isle SPA	6,666	13,332	167.1	0.01	0.080	0.047
Foula SPA	6,351	12,702	228.6	0.01	0.039	0.023
North Rona and Sula Sgeir SPA	2,834	5,668	242.8 – 261.0	0.02	0.009	0.005
Forth Islands SPA	58,980	117,960	240.1 - 283.1	0.17	0.756	0.446
Noss SPA	597	1,194	240.8 - 245.7	0.02	0.002	0.001
Additional colonies and non-designated sites	76,257	152,514	51.3 – 454.2	3.64	0.404	0.239

Note, the residual weight assigned to non-SPA colonies are presented here as an overall total. Further breakdown of these sites is provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South).

* Applying correction factor x 2.00 for total adult breeding numbers (Hughes *et al*. 2019[7] and Mitchell *et al*. 2004[8]).

3.1.6 Gannet

3.1.6.1 The weightings for apportioning breeding season gannet to designated sites within MMFR+1SD of the Caledonia South Site are given in Table 3-5. These weightings were used to apportion the potential number of gannet distributional response and collision mortalities to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-5: Gannet breeding season (Mid-March to September) apportioning weightings to designated sites.

Site Name	SMP Database Counts (Individuals)	Distance to the Caledonia South Site (km)	1/Proportion of Foraging Range at Sea	Resulting Weight	Proportional Weight
Sule Skerry and Sule Stack SPA	15,648	162.7 - 163.8	0.02	0.092	0.048
Fair Isle SPA	11,184	167.1	0.01	0.065	0.034
North Rona and Sula Sgeir SPA	18,990	261.0	0.01	0.044	0.023
Forth Islands SPA*	162,000	253.3	0.02	0.719	0.379
Noss SPA	24,670	245.7	0.01	0.067	0.035
Hermaness, Saxa Vord and Valla Field SPA	39,606	325.6	0.01	0.059	0.031
Additional colonies and non-designated sites	147,271	51.5 - 446.8	0.12	0.814	0.429

Note, the residual weight assigned to non-SPA colonies are presented here as an overall total. Further breakdown of these sites is provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South).

* The Forth Islands SPA colony count takes into account the 2021 estimated Bass Rock drone count of 81,000 AOS (Harris *et al.*, 2023[9]; Wanless *et al.*, 2023[10]), approach agreed with NatureScot within a consultation meeting on 07 August 2025.

3.2 Non-breeding Season

3.2.1 Overview

3.2.1.1 The apportioning weightings of predicted impacts from the Caledonia South Site for all designated site qualifying features screened in for assessment are provided within this section for the non-breeding season (Table 3-6 to Table 3-14).

3.2.2 Kittiwake

3.2.2.1 The non-breeding defined seasons for kittiwake were based on Furness (2015[12]), which were modified to align with the NatureScot (2020[11]) breeding season periods (Table 2-4).

3.2.2.2 The weightings for apportioning non-breeding season kittiwake to designated sites are provided in Table 3-6 for autumn migration (September to December), and for spring migration (January to Early-April) and were based on the UK North Sea BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding kittiwake distributional response and collision mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

3.2.3 Great Black-Backed Gull

3.2.3.1 The non-breeding defined seasons for great black-backed gull were based on NatureScot (2020[11]) guidance (Table 2-4).

3.2.3.2 The weightings for apportioning non-breeding season great black-backed gull to designated sites are provided in Table 3-7 for non-breeding season (September to March) and were based on the UK North Sea BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding great black-backed gull collision mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-6: Kittiwake apportionment of adult mortality within the UK North Sea BDMPS during the non-breeding season (Autumn migration: September to December; Spring migration: January to Early-April).

Site Name	UK North Sea Adults Associated with the SPA	Autumn Migration		Spring Migration	
		UK North Sea Total Birds	Proportional Weighting	UK North Sea Total Birds	Proportional Weighting
East Caithness Cliffs SPA	48,492	829,937	0.058	627,816	0.077
North Caithness Cliffs SPA	12,180	829,937	0.015	627,816	0.019
Troup, Pennan and Lion's Heads SPA	17,875	829,937	0.022	627,816	0.028
Copinsay SPA	799	829,937	0.001	627,816	0.001
Hoy SPA	476	829,937	0.001	627,816	0.001
Buchan Ness to Collieston Coast SPA	15,050	829,937	0.018	627,816	0.024
Rousay SPA	2,117	829,937	0.003	627,816	0.003
Marwick Head SPA	631	829,937	0.001	627,816	0.001
Calf of Eday SPA	896	829,937	0.001	627,816	0.001
West Westray SPA	14,466	829,937	0.017	627,816	0.023
Fowlsheugh SPA	11,204	829,937	0.013	627,816	0.018
Cape Wrath SPA	207	829,937	<0.001	627,816	<0.001
Fair Isle SPA	925	829,937	0.001	627,816	0.001
Sumburgh Head SPA	252	829,937	<0.001	627,816	<0.001
Foula SPA	392	829,937	<0.001	627,816	0.001

Site Name	UK North Sea Adults Associated with the SPA	Autumn Migration		Spring Migration	
		UK North Sea Total Birds	Proportional Weighting	UK North Sea Total Birds	Proportional Weighting
North Rona and Sula Sgeir SPA	25	829,937	<0.001	627,816	<0.001
Forth Islands SPA	3,720	829,937	0.004	627,816	0.006
Noss SPA	608	829,937	0.001	627,816	0.001
St Abb's Head to Fast Castle SPA	4,084	829,937	0.005	627,816	0.007
Handa SPA	37	829,937	<0.001	627,816	<0.001
Shiant Isles SPA	11	829,937	<0.001	627,816	<0.001
Farne Islands SPA	4,132	829,937	0.005	627,816	0.007
Hermaness, Saxa Vord and Valla Field SPA	469	829,937	0.001	627,816	0.001

Table 3-7: Great black-backed gull apportionment of adult mortality within the UK North Sea BDMPS during the non-breeding season (September to March).

Site Name	UK North Sea Adults Associated with the SPA	Non-breeding Season	
		UK North Sea Total Birds	Proportional Weighting
Copinsay SPA	436	91,399	0.005
East Caithness Cliffs SPA	350	91,399	0.004

3.2.4 Herring Gull

3.2.4.1 The non-breeding defined seasons for herring gull were based on NatureScot (2020[11]) guidance (Table 2-4).

3.2.4.2 The weightings for apportioning non-breeding season herring gull to designated sites are provided in Table 3-8 for non-breeding season (September to March), and were based on the UK North Sea and Channel waters BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding herring gull collision mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-8: Herring gull apportionment of adult mortality within a regional population during the non-breeding season (September to March).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Non-breeding Season	
		UK North Sea Total Birds	Proportional Weighting
East Caithness Cliffs SPA	6,718	466,511	0.014
Troup, Pennan and Lion's Heads SPA	3,162	466,511	0.007
Buchan Ness to Collieston Coast SPA	6,166	466,511	0.013

3.2.5 Guillemot

3.2.5.1 The non-breeding defined seasons for guillemot were based on NatureScot (2020[11]) guidance (Table 2-4).

3.2.5.2 The weightings for apportioning non-breeding season guillemot to designated sites are provided in Table 3-9 for non-breeding season (Mid-August to March) and were based on the UK North Sea and Channel waters BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding guillemot distributional response mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-9: Guillemot apportionment of adult mortality within a regional population during the non-breeding season (Mid-August to March).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Non-breeding Season	
		UK North Sea Total Birds	Proportional Weighting
East Caithness Cliffs SPA	149,100	1,617,306	0.092
North Caithness Cliffs SPA	65,800	1,617,306	0.041
Troup, Pennan and Lion's Heads SPA	15,313	1,617,306	0.009
Copinsay SPA	7,850	1,617,306	0.005
Hoy SPA	8,820	1,617,306	0.005
Buchan Ness to Collieston Coast SPA	20,658	1,617,306	0.013
Rousay SPA	8,680	1,617,306	0.005
Marwick Head SPA	15,536	1,617,306	0.010
Calf of Eday SPA	8,820	1,617,306	0.005
West Westray SPA	47,460	1,617,306	0.029
Sule Skerry and Sule Stack SPA	763	1,617,306	<0.001
Fair Isle SPA	18,929	1,617,306	0.012

3.2.6 Razorbill

3.2.6.1 The non-breeding defined seasons for razorbill were based on Furness (2015[12]), which were modified to align with the NatureScot (2020[11]) breeding season periods (Table 2-4).

3.2.6.2 The weightings for apportioning non-breeding season razorbill to designated sites are provided Table 3-10 autumn/spring migrations (Mid-August to October; January to March), and Table 3-11 for winter (November to December), and were based on the UK North Sea and Channel waters BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding razorbill distributional response mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-10: Razorbill apportionment of adult mortality within a regional population during the non-breeding season (Autumn/Spring migrations: Mid-August to October; January to March).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Autumn/Spring Migration	
		UK North Sea Total Birds	Proportional Weighting
East Caithness Cliffs SPA	25,000	591,874	0.042
North Caithness Cliffs SPA	3,230	591,874	0.005
Troup, Pennan and Lion's Heads SPA	3,486	591,874	0.006
West Westray SPA	1,045	591,874	0.002
Fair Isle SPA	1,738	591,874	0.003

Table 3-11: Razorbill apportionment of adult mortality within a regional population during the non-breeding season (Winter: November to December).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Winter	
		UK North Sea Total Birds	Proportional Weighting
East Caithness Cliffs SPA	7,500	218,622	0.034
North Caithness Cliffs SPA	1,020	218,622	0.005
Troup, Pennan and Lion's Heads SPA	1,046	218,622	0.005
West Westray SPA	330	218,622	0.002
Fair Isle SPA	549	218,622	0.003

3.2.7 Puffin

3.2.7.1 The non-breeding defined seasons for puffin were based on NatureScot (2020[11]) guidance (Table 2-4).

3.2.7.2 The weightings for apportioning non-breeding season puffin to designated sites are provided in Table 3-12 for non-breeding season (Mid-August to March) and were based on the UK North Sea and Channel waters BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding puffin distributional response mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-12: Puffin apportionment of adult mortality within a regional population during the non-breeding season (Mid-August to March).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Non-breeding Season	
		UK North Sea Total Birds	Proportional Weighting
North Caithness Cliffs SPA	293	231,957	0.001
Hoy SPA	1,050	231,957	0.005
Cape Wrath SPA	3	231,957	<0.001
Sule Skerry and Sule Stack SPA	119	231,957	0.001
Fair Isle SPA	3,212	231,957	0.014
Foula SPA	6,750	231,957	0.029
North Rona and Sula Sgeir SPA	11	231,957	<0.001
Forth Islands SPA	62,231	231,957	0.268
Noss SPA	241	231,957	0.001

3.2.8 Gannet

3.2.8.1 The non-breeding defined seasons for gannet were based on Furness (2015[12]), which were modified to align with the NatureScot (2020[11]) breeding season periods (Table 2-4).

3.2.8.2 The weightings for apportioning non-breeding season gannet to designated sites are provided Table 3-13 autumn migration (October to November) and Table 3-14 for spring migration (December to Early-March), and were based on the UK North Sea and Channel waters BDMPS abundance data. These weightings were used to apportion the potential numbers of non-breeding gannet distributional response and collision mortalities during the non-breeding season to each of the designated sites (apportioned mortalities are presented within Volume 8, Appendix 6).

Table 3-13. Gannet apportionment of adult mortality within a regional population during the non-breeding season (Autumn migration: October to November).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Autumn Migration	
		UK North Sea Total Birds	Proportional Weighting
Sule Skerry and Sule Stack SPA	935	456,298	0.002
Fair Isle SPA	6,278	456,298	0.014
North Rona and Sula Sgeir SPA	1,845	456,298	0.004
Forth Islands SPA	110,964	456,298	0.243
Noss SPA	15,627	456,298	0.034
Hermaness, Saxa Vord and Valla Field SPA	38,965	456,298	0.085
Flamborough and Filey Coast SPA	22,122	456,298	0.048

Table 3-14: Gannet apportionment of adult mortality within a regional population during the non-breeding season (Spring migration: December to Early-March).

Site Name	UK North Sea and Channel Waters Adults Associated with the SPA	Spring Migration	
		UK North Sea Total Birds	Proportional Weighting
Sule Skerry and Sule Stack SPA	0	248,385	0.000
Fair Isle SPA	5,494	248,385	0.022
North Rona and Sula Sgeir SPA	0	248,385	0.000
Forth Islands SPA	77,675	248,385	0.313
Noss SPA	13,674	248,385	0.055
Hermaness, Saxa Vord and Valla Field SPA	34,094	248,385	0.137
Flamborough and Filey Coast SPA	15,485	248,385	0.062

4 Conclusion

4.1.1.1 This appendix provides details regarding the approach by which potential collision and distributional response mortalities were apportioned to designated and non-designated colonies to inform the updated RIAA conclusions for Caledonia South (Volume 8, Appendix 6).

4.1.1.2 Apportioning has been undertaken using NatureScot (2018[2]) guidance for the following species:

- Kittiwake;
- Herring gull;
- Guillemot;
- Razorbill;
- Puffin; and
- Gannet.

4.1.1.3 The weightings which have been used to apportion predicted impacts from the Caledonia South Site for all qualifying features screened in for assessment are provided within this Section 3.1 for the breeding season (Table 3-1 to Table 3-5) and Section 3.2 for the non-breeding season (Table 3-6 to Table 3-14). Full lists of colonies and non-designated sites (during the breeding season) are provided in Volume 8, Appendix 15: Ornithology Apportioning Results (Caledonia South).

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